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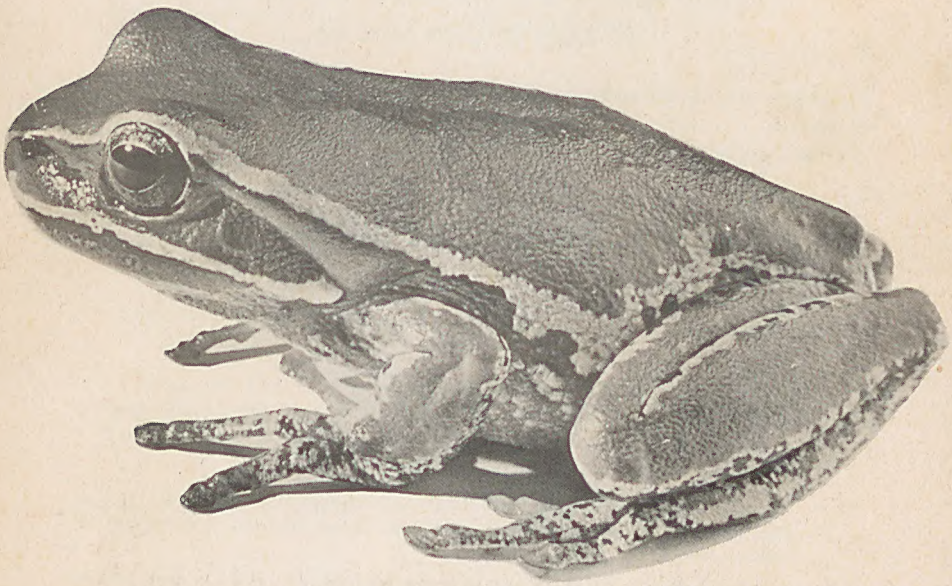
HERPETOFAUNA



New species of Litoria (description in press)
from Southern Queensland and Central N.S.W.

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1. To collect and exchange information on all aspects of Australasian reptiles and amphibians by means of monthly meetings and publication of Herpetofauna.
2. To encourage the study of reptiles and amphibians — both in their natural state and in captivity.
3. To promote a sane and reasonable attitude to reptiles and amphibians among the general public.
4. To assist in the organization of field work in all parts of Australia and to assist members on study trips away from their home territory.

HERPETOFAUNA

Vol.7 No.1 June, 1974

Editorial Committee: H. Cogger, D. Millar, G. Swan

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Cover photograph supplied by Miss M. Anstis.

LITORIA BREVIPALMATA
AN ADDITION TO THE QUEENSLAND AMPHIBIAN LIST

by K.R. McDonald
National Parks Branch, Department of Forestry,
Brisbane, Qld. 4000.

Introduction:
During a survey of the vertebrate fauna of the National Parks of south-eastern Queensland two specimens of the hylid frog Litoria brevipalmata were collected. These are the first records of this species in Queensland.

Localities and Biological Data:
The collection localities shown in Fig. 1 are Crows Nest (N.P. 629) and Ravensbourne (N.P. 492) National Parks. Crows Nest National Park (152° 06'E, 27° 15'S) has low open Eucalyptus forest, an average altitude of 419 metres and an average rainfall of 83.6 cm.

Ravensbourne National Park (152° 12'E, 27° 21'S) has low closed forest with Eucalyptus emergents and open grassy Eucalyptus forest, an average altitude of 625 metres and an average annual rainfall of 126.71 cm.

Specimen A496 (National Park Branch Zoology collection) was collected during the day of 8.1.74 at approximately 11 a.m. in Crows Nest National Park at an altitude of 350 metres. Heavy rain had fallen in the previous three days and intermittent rain had fallen during the morning. The specimen was sitting exposed on a grass and sedge area on the edge of a 7 metre diameter pool of water in a large depression in granite rock, 10 metres from the edge of Crows Nest Creek.

Vegetation consisted of Leptospermum sp. thicket on one side and low open grassy Eucalyptus forest on the other.

Other species collected in this pool were Adelotus brevis (A558), Litoria peroni (A449-500), Litoria rubella (A619), Litoria glauerti (A543), Uperoleia marmorata (A504-506), Limnodynastes peroni was observed but not collected. Species found in the adjoining area of the National Park were Limnodynastes ornatus (A552), Litoria lesueuri (A549), Litoria latopalmata (A551), Mixophyes fasciolatus (A501), Pseudophryne coriacea (A507-508), Pseudophryne bibroni (A615), and Ranidella signifera (A613).

The second specimen (A517) was collected on the night of 8.1.74 at approximately 8.30 p.m. in grassy open Eucalyptus forest in Ravensbourne National Park at an altitude of 579 metres. It was sitting on a fallen branch 5 cm above ground on an otherwise bare soil area in a fire break about 50 metres from any known waterhole.

Other species collected in the area were Adelotus brevis (A531), Litoria glauerti (A530), Litoria latopalmata (A518), Litoria lesueuri (A521), Litoria chloris (A516), Litoria verreauxi (A618), Litoria caerulea (A513), Limnodynastes terraereginae (A509-510), Limnodynastes peroni (A514), Limnodynastes tasmaniensis (A515), Mixophyes fasciolatus (A519), and Pseudophryne coriacea (A524-526).

Measurements of Queensland Specimens of L. brevipalmata compared with Holotype, Paratypes and S.A.M. Specimen. Measurements follow Tyler (1968).

	S-V Length	EN/IN Ratio	HL/HW Ratio	LH/S-V Ratio	TL/S-V Ratio
Holotype S.A.M. R11236	41.0 mm	1.267	1.128	0.324	0.459
Paratype AM R30835	41.0 mm	1.258-1.433	1.078-1.092	0.336-0.349	0.409-0.429
Paratype MUZD 13/70	45.2 mm				
Paratype MUZD 190/70	47.4 mm				
A496	35.9 mm	1.400	1.094	0.328	0.451
A517	38.5 mm	1.428	1.066	0.377	0.493
S.A.M. R11342A	41.6 mm	1.500	1.034	0.358	0.456

S-V-Snout Vent, EN-Eye Naris, IN-Internarial Span, HL-Head Length, HW-Head Width, TL-Tibia Length.

Discussion:

The collection of L. brevipalmata at these localities means an extension of range of 466 kilometres from the nearest known published locality. Tyler, Martin and Watson (1971) gave the range of L. brevipalmata as "central coastal New South Wales". The Queensland specimens were collected at altitudes between 350 metres and 579 metres, 96 kilometres from the coast on the Eastern watershed on the Great Dividing Range. This is not coastal but still east of the divide.

Little data was published on habitat preferences of the species by Tyler et al in 1971. In both cases Queensland specimen were collected in similar situations and under similar conditions to those described by Tyler, Martin and Watson.

It is reasonable to assume that it will only be a matter of time before specimens of L. brevipalmata are collected between the known Queensland and New South Wales localities providing care is taken in collecting what may be a relatively scarce species.

Acknowledgements:

Mr. M.J. Tyler (South Australian Museum) has provided comparative material. Mr. P.S. Ogilvie, Mr. C. Limpus (National Parks) and Miss J. Covacevich (Queensland Museum) have given helpful advice.

References:

Tyler M.J., A.A. Martin and G.F. Watson 1971 — A New Species of Hylid Frog from New South Wales — Proc of the Linnean Society of N.S.W. Vol 97:82-86.

Tyler M.J. 1968 — Papuan Hylid Frogs of the Genus Hyla. Zoologische Verh, Leiden (96):1-203.

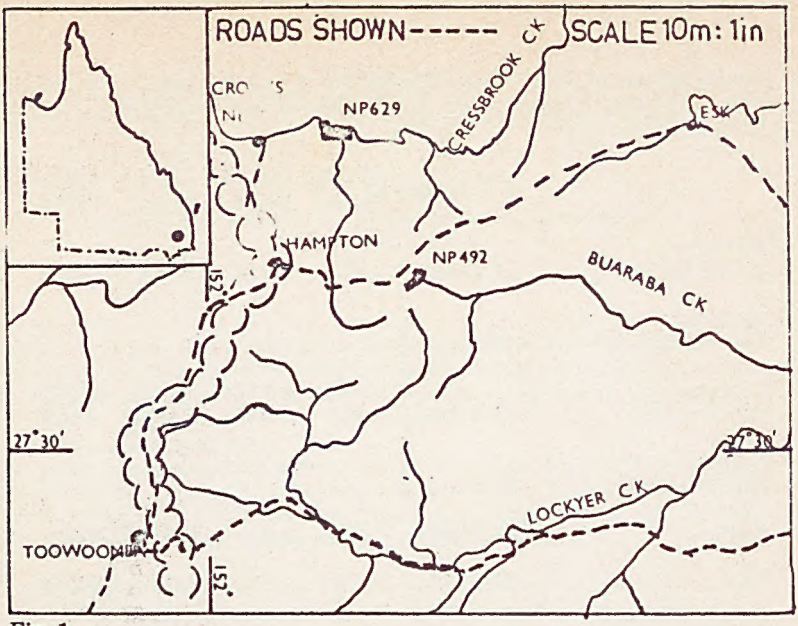

Fig. 1
Collecting Localities — Litoria brevipalinata

GUT CONTENTS OF SOME AMPHIBIANS & REPTILES

by A. Barclay Rose
National Parks and Wildlife Serive, Sydney

Introduction:
All the specimens listed come from Ku-ring-gai Chase National Park. Most of them having been picked up dead on the roads in good to very bad condition. Details have been kept of weight, length and exact locality.

Several specimens had ectoparasites and practically all had one or several species of endoparasites, which have been preserved. The gut contents and parasites are being held by The Australian Museum.

In the case of Lepidoptera, if larvae were found as well as adults "L-larvae" will be found in the remarks column of the chart. If only larvae were found the remarks column will show "L- larvae only".

Acknowledgements:
Dr. H.G. Cogger, Curator of Amphibians and Reptiles, The Australian Museum for his unfailing help in many ways.

The Australian Museum Entomology department for checking insect remains. In particular Dr. D.K. McAlpine, Mr. G.A. Holloway and Mr. M.R. Gray.

The staff of Ku-ring-gai Chase National Park for supplying dead specimens from the roads and in the picnic areas.

References:
H.G. Cogger — Frogs of N.S.W. (Australian Museum publication)

The Insects of Australia (C.S.I.R.O. publication)

J.R. Kinghorn — The Snakes of Australia (Angus & Robertson)

Species	Date	Amphibia	Reptilia	Mammalia	Araneida	Diplopoda	Odonata	Blattodea	Isoptera	Plecoptera	Orthoptera	Phasmatodea	Hemiptera	Coleoptera	Diptera	Lepidoptera	Hymenoptera	Flora	Remarks
Heleioporus australiacus	2 March, 1968							*									*		Formicidae Camponotus consobrinus and other spp.
As above	16 April, 1968							*									*		As above — also four "Bull Ants" Myrmecia tarsata
Limnodynastes peronii	28 Oct, 1967																		Empty. Unidentifiable remains in lower gut
As above	Feb. 1969				*								*			*			Homoptera "Trapdoor Spiders" Ctenizidae — Arbanitis or Dyarcyops sp.
As above	9 March, 1969													*					Elateridae
As above	31 Aug. 1969																*		Formicidae
As above	14 Nov. 1969																	*	moss. Unidentifiable insect remains in lower gut.
As above	6 Dec. 1969													*	*				Beetle larva. Fly — Sciaridae
As above	20 Dec. 1969															*			Stomach empty. Lower gut L-scales and remains
Limnodynastes ornatus	Feb. 1969													*			*		Carabidae, Scarabaeidae, Elateridae. Formicidae
Limnodynastes dorsalis	Feb. 1969				*						*		*				*		Tettigoniidae. Pentatomidae. Formicidae
As above	12 Dec. 1969																*		Formicidae
Pseudophryne australis	23 May 1969							*									*		Formicidae
As above	14 Mar.1969																*		Formicidae (Specimen from stomach of Notechis scutatus)
Pseudophryne bibronii	24 Jan. 1969													*			*		Curculionidae Formicidae
Crinia signifera	17 Aug. 1968													*					
As above	7 Sept. 1968																*		Formicidae
As above	18 Aug. 1970																		Empty
Litoria caerulea	2 Dec. 1969										*								Gryllacrididae
As above	9 Dec. 1969				*								*	*		*			Pentatomidae. Scarabaeidae. L — larva only
Litoria phyllochroa	16 Jan. 1968																		Empty
As above	Feb. 1969				*														
As above	1 Nov. 1969									*							*		
Litoria verreauxii	Feb. 1969				*						*					*			Gryllidae
Litoria freycineti	25 Nov. 1969								*										

Species	Date	Amphibia	Reptilia	Mammalia	Araneida	Diplopoda	Odonata	Blattodea	Isoptera	Plecoptera	Orthoptera	Phasmatodea	Hemiptera	Coleoptera	Diptera	Lepidoptera	Hymenoptera	Flora	Remarks
Litoria jervisiensis	10 Feb. 1969												*	*		*	*		Homoptera nymph. Scarabaedidae. L — larva only
Phyllurus platurus	26 Jan. 1968													*					Elateridae
As above	As above													*					As above
Tiliqua scincoides	6 Oct. 1967																		Empty
As above	23 Nov. 1967			*										*		*			L — larvae. Claw and two phalanges of a Possum — decaying
As above	27 Dec. 1967							*						*		*			Carabidae and others. L — larva only
As above	6 Dec. 1969															*		*	L — larvae only. Fruit of Persoonia sp.
As above	15 Dec. 1969															*		*	L — larvae only. Fruit of undetermined plant
As above	25 Jan. 1970							*						*				*	Fruit of Persoonia sp. Other unidentifiable insect remains.
As above	19 Feb. 1970																		Squashed, not much left of insides but found remains of Mollusca — Helix sp.
Cryptoblepharus boutonii	27 Nov. 1966																*		Formicidae
As above	28 Dec. 1967																		Unidentifiable insect remains
Leiolopisma delicata	29 April 1969																		Unidentifiable insect remains
As above	4 Feb. 1970															*	*		And Crustacea — Amphipoda — Talitris sp. and Dermaptera. Formicidae
As above	1 Feb. 1969															*			One moth only
Leiolopisma mustelina	6 Mar. 1969																		Mollusca — small flat snail
Ctenotus taeniolatus	25 Sept. 1967								*		*						*		Tetrigidae. Formicidae (Specimen from stomach of Varanus varius)
Sphenomorphus tenuis	Nov. 1967													*		*			
As above	30 Oct. 1967				*									*			*		Curculionidae. Formicidae — Rhytidoponera sp.
Sphenomorphus quoyii	8 Mar. 1968																		Stomach empty. Unidentifiable remains in lower gut
As above	1 Dec. 1969				*								*	*					C — larva only
Saiphos equalis	14 June 1968																		Unidentifiable insect remains and endoparasite
Physignathus lesueurii	11 Jan. 1968													*			*	*	Scarabaeidae. Formicidae. Dianella sp, berries.
As above	31 Jan. 1968												*	*		*		*	Heteroptera. L — larvae only. Flower bud.

Species	Date	Amphibia	Reptilia	Mammalia	Araneida	Diplopoda	Odonata	Blattodea	Isoptera	Plecoptera	Orthoptera	Phasmatodea	Hemiptera	Coleoptera	Diptera	Lepidoptera	Hymenoptera	Flora	Remarks
Physignathus lesueurii	16 April 1968				*									*			*		Formicidae
As above	16 Oct. 1968				*									*		*	*		L — larva only. Formicidae, Apidae Apis mellifera
As above	8 Jan. 1969					*	*	*						*		*	*	*	L — larva only. Formicidae. Dianella sp. berry
As above	20 Nov. 1969				*									*		*	*		Thynnidae. Thynnoides sp. ♂&♀ L — larvae. Tiphiidae
As above	22 Nov. 1969					*								*		*	*		L — larva and eggs. Formicidae, Apoidea. C — larvae
As above	12 April 1970				*									*			*		Formicidae
Amphibolurus barbatus	12 Sept. 1967										*			*	*	*	*		Acrididae. Curculionidae and others. L — larvae only. Formicidae
As above	14 Sept. 1967													*				*	Curculionidae & others. Twenty or more green leaves - round 1 cm dia.
As above	14 Nov. 1968							*			*			*			*		Tettigoniidae, Eumasticidae. Curculionidae and others. Formicidae — Various, including Myrmecia tarsata
As above	4 Oct. 1969				*									*		*	*	*	Scarabaeidae — Dynastinae. L — larva only Apidae Apis mellifera Compositae flower heads In lower gut — Graminae flower heads and leaves.
As above	15 Oct. 1969											*		*		*	*		Curculionidae. L — larva only. Formicidae Myrmecia gulosa & others
Varanus varius	25 Sept. 1967		*								*					*			Ctenotus taeniolatus. L — larva only. Remains of smaller skink in lower gut
As above	17 Dec. 1967				*						*					*			Tettigoniidae. L — larva only
As above	22 Dec. 1967										*					*			Gryllacrididae, Stenopelmatidae, Acrididae L — larva Sphingidae Coequosa sp. only
As above	21 Oct. 1968		*								*								Stomach empty. Leiolopisma sp. and Gryllacrididae remains in lower gut
As above	30 Dec. 1968										*								Stomach empty. Gryllacrididae & other insect remains in lower gut
As above	27 Dec. 1969										*			*		*	*		Tettigoniidae & Acrididae. Cerambycidae. L — larvae. Formicidae
As above	27 Dec. 1969			*								*		*		*			Scarabaeididae. L — larvae. Fur, bones of small mammal. Also bits of chop bone and apple. (near picnic area)
Morelia spilotes s.	23 Jan. 1968			*															One whisker only, otherwise empty

Species	Date	Amphibia	Reptilia	Mammalia	Araneida	Diplopoda	Odonata	Blattodea	Isoptera	Plecoptera	Orthoptera	Phasmatodea	Hemiptera	Coleoptera	Diptera	Lepidoptera	Hymenoptera	Flora	Remarks
Morelia spilotes s.	23 Feb. 1969			*															♀ Ringtail Possum Pseudecheirus peregrinus & furred pouch young
Dendrelaphis punctulatus	23 Jan. 1968	*																	Limnodynastes peronii
As above	18 Dec. 1969		*																Empty. Few unidentifiable scales of a skink in lower gut
Acanthophis antarcticus	24 Oct. 1966																		Empty.
As above	28 Dec. 1967		*																Leiolopisma delicata and another species remains
As above	16 April 1968			*															Rodentia
As above	25 Nov. 1969																		Empty
As above	10 Dec. 1969																		Empty. Unidentifiable remains in lower gut
Cacophis squamulosus	16 Mar. 1967		*																3 skink tails only. Leiolopisma sp.
As above	23 Jan. 1970		*																Leiolopisma sp. tail only in stomach. Feet and other remains in lower intestine
Unechis nigrescens	14 Jan. 1968		*																Ctenotus taeniolatus
As above	6 Mar. 1968																		Empty. Unidentifiable remains in lower gut
Hemiaspis signata	1 April 1969		*																Leiolopisma sp. tail
Pseudonaja textilis	13 Oct. 1968																		Empty
As above	22 Mar. 1970																		Empty
Demansia psammophis	26 April 1968															*			Scales
As above	24 July 1969																		Empty
Pseudechis porphyriacus	1 Mar. 1967																		Empty. Unidentifiable remains in lower gut
As above	8 Jan. 1968																		Empty
As above	12 April. 1969	*	*																Limnodynastes peronii. Tiliqua scincoides and a tail of Pygopus lepidopodus
As above	30 Sept. 1969																		Empty Unidentifiable remains in lower gut
As above	15 Jan. 1970		*																Egernia cunninghami
Notechis scutatus	14 Mar. 1969	*	*																Pseudophryne australis and Leiolopisma sp.
As above	7 Dec. 1969																		Empty. Unidentifiable remains in lower gut

AN INTRODUCTION TO THE STUDY OF AUSTRALIAN TADPOLES

by Miss M. Anstis
630 King Georges Road, Penshurst, N.S.W.

Some 150 species of frogs are known to occur in Australia, most of which have been described in scientific journals and many included in the few available books on our frogs. However, the importance of the tadpoles which give rise to these frogs has been sadly neglected — so little work has been done on them that books can only briefly describe the life cycle of a 'typical' frog, thus helping to further the misconception that the tadpoles of all frogs look the same. A few papers describing some of our tadpoles have been published in scientific journals, but the field is open for a great volume of work still to be done.

Visits to various freshwater ponds and streams, particularly during spring and summer, should result in a number of basic observations being made concerning tadpoles.

1. Prevalence

They are limited in number or not present at all, in water which is polluted, or which contains large numbers of the predatory introduced fish Gambusia (sometimes known as 'mudgudgeons' or 'mosquito fish'). These small fish tear viciously at the tail of a tadpole and finally attack the helpless body.

2. Position in Habitat

In the shallow parts of fast flowing streams, tadpoles are found on the bottom, while in still or very slowly flowing water, they are also seen in mid-water or near the surface.

3. Behaviour

Species which frequent the surface of ponds will often be observed hovering in a near vertical position with head up, but are also capable of swift, darting movements when disturbed. Those living mostly on the bottom of still ponds generally move less actively. Specimens found in fast flowing streams cling to the substratum by means of a sucker mouth, and are strong swimmers.

4. Body Proportions.

Different species vary in the maximum size attained and in the shape and dimensions of the body and tail.

5. Pigmentation

The colour is variable; not only between species, but also amongst individuals of the same species from different localities. In any single pond or stream, however, the tadpoles of any one species are more than likely to have similar pigmentation.

If a sample of different populations is collected and studied more carefully, further differences between species will be seen. The most obvious features of a tadpole are the body and tail, and the shape and dimensions of these can be related to the behaviour of the tadpole and the type of habitat in which it lives. Fig. 1 shows four basic shapes of

tadpoles living in different environments. Types A and B are found in still ponds (lentic) or very slowly flowing pools in a stream; C lives in shallow flowing sections of streams (lotic) and D develops in moist conditions on land (terrestrial).

The two lentic types are adapted to different life styles. Type A often swims near the surface, but can remain hovering at any level in the water by rapidly undulating the fine tail tip. The deep tail fins enable sudden changes of direction, much like the action of a rudder on a boat. Type B is commonly found on the substratum and has fins of moderate depth and no specialised flexible tail tip, using the whole tail when swimming.

The lotic type C has a shallow, more stream-lined body and tail, which decreases water resistance. A thick, strong tail musculature helps the tadpole to swim against the current.

Type D, being terrestrial, (Watson and Martin, 1973), has a large yolk sac (storage of food) and reduced tail fins.

The following table gives a list of some of the species belonging to each type.

TABLE 1

Type A	Type B	Type C	Type D
Litoria peroni	Limnodynastes peroni	Litoria citropa	Crinia rosea
Litoria verreauxi	Limnodynastes tasmaniensis		Crinia lutea
Litoria aurea	Limnodynastes fletcheri	Litoria lesueuri	
Litoria dentata	Limnodynastes d. dumerili	Litoria booroolongensis	
Litoria brevipalmata	Limnodynastes d. grayi	Litoria nannotis	
Litoria glauerti	Uperoleia marmorata	Mixophyes balbus	
Crinia haswelli	Heleioporus australiacus	Mixophyes fasciolatus	
	Pseudophryne species		
	Crinia signifera		
	Litoria phyllochroa		
	Litoria chloris		

The mouth of the tadpole is also adapted to suit a particular way of life and is studied extensively to help determine further differences between species. Fig. 2 shows four of the many contrasting mouth-parts of tadpoles. Example 1 is the basic mouth structure of Litoria verreauxi (an active type A tadpole), and is very similar to that of some other Hylids. There are five tooth rows, two of which are broken in the middle, and a central 'beak' used during grazing on detritus or vegetation anywhere in the pond. Example 2 belongs to Heleioporus australiacus, a large type B tadpole. Note the broad beak and larger number of tooth rows, which probably increase the tadpole's efficiency while scraping food from the substratum. Examples 3 (a new species of Litoria, see cover photograph of adult) and 4 (Litoria booroolongensis) are both type C species and have a large number of papillae (small tubercles) over the fairly large lips of the mouth. These help the tadpole to cling by suction to rocks. The new species of Litoria (Tyler and Anstis, in press) has no tooth rows and there is a unique central structure (where there would normally be a beak), from which fine black filaments project. The exact function of this obviously specialised mouth is unknown. Type C tadpoles mostly feed on the bottom of the stream..

Pigmentation is a useful factor in species recognition to some degree, but it must be remembered that tadpoles are capable of colour change and this is often affected by the environment. Some species will gradually turn darker when placed in a pond which is mostly in shadow or which has a dark substratum. The same specimens can change to a much lighter shade if transferred to a pond which is generally in sunlight, with a light sandy floor. Frequent observations of various species in different localities will enable more accurate recognition and help establish the extent of colour variation in each species. Identification should be confirmed by raising specimens to metamorphosis. Living tadpoles of most species are usually some shade of brown, gold or black dorsally, with or without speckled markings, and most have an iridescent copper-gold sheen over much of the ventral and lateral surfaces (H. australiacus has a blue sheen). The tail fins vary from clear to dusky and some have distinctive spots over the tail. Hylid tadpoles often have less pigment over the front half of the dorsal surface — particularly around the eyes and between the nostrils. In a number of species, there is little or no pigment on the ventral surface over the heart and gills, and these organs are clearly visible through the skin, without the aid of magnification. Preserved tadpoles lose their gold pigment, with only the really dark pigment (melanophores) remaining.

For the purposes of comparative study, the development of the frog from egg to metamorphosis has been described in numbered stages from 1 to 46, by Gosner (1960). This allows comparisons to be made between different species at the same stage of development — e.g. the average total length of a sample of Crinia signifera tadpoles at stage 35 would be found to be much less than that of Mixophyes fasciolatus at the same stage. However, since the growth of tadpoles is affected by insufficient food, overcrowding and other factors, samples to be measured should preferably be collected straight from the field rather than taken from groups kept in captivity. Specimens should be preserved in 4% formalin for at least two days before measuring is done (to allow time for the small amount of shrinkage which will occur in formalin). The total length and other dimensions of tadpoles at various stages are useful factors in studying differences between species. Perhaps the largest of known Leptodactylid tadpoles would be those of the Mixophyes genus (the Great Barred River frogs), and among the smallest would be Assa darlingtoni (a species in which the tadpoles

develop in pouches on the back of the male adult frog) and some members of the genus Crinia. Of the known Hylid tadpoles, Litoria aurea and Litoria peroni are two of the largest, and Litoria glauerti one of the smallest.

Maintaining Tadpoles in Captivity

To grow to their maximum size at a normal rate and then metamorphose, tadpoles require sufficient suitable food, conditions as close to their natural environment as possible and enough space. Large aquaria containing rooted and some surface plants, with small amounts of decomposing leaf litter on the bottom are adequate, but tadpoles will grow faster if the water is not too deep and there is a large surface area. Exposure to sunlight for at least part of the day is necessary, as long as this does not raise the water temperature beyond about 27°, and type C tadpoles often fare better if the aquarium is filtered. To avoid overcrowding, work to the principle of 'an inch of tadpole to a gallon of water', unless the tank is filtered, when the number can be increased. Food in the aquaria will consist of natural algae and other plants, and detritus (decaying matter), but added fish food, boiled lettuce or spinach and occasionally meat will greatly improve the diet. Fish food should be given daily, lettuce about twice a week and a few small morsels of meat no more than once a week.

Although this article has described only four ecological types of Australian tadpoles, others may be recognised. It should also be remembered that individual species of each type vary, and do not all have exactly the same shape as in the Fig. 1 diagrams, which are intended only as a guide to the main differences between species adapted to different environments. This introduction to our tadpoles is merely an outline and it is hoped the reader will consult the literature below for further information and begin a study of his own.

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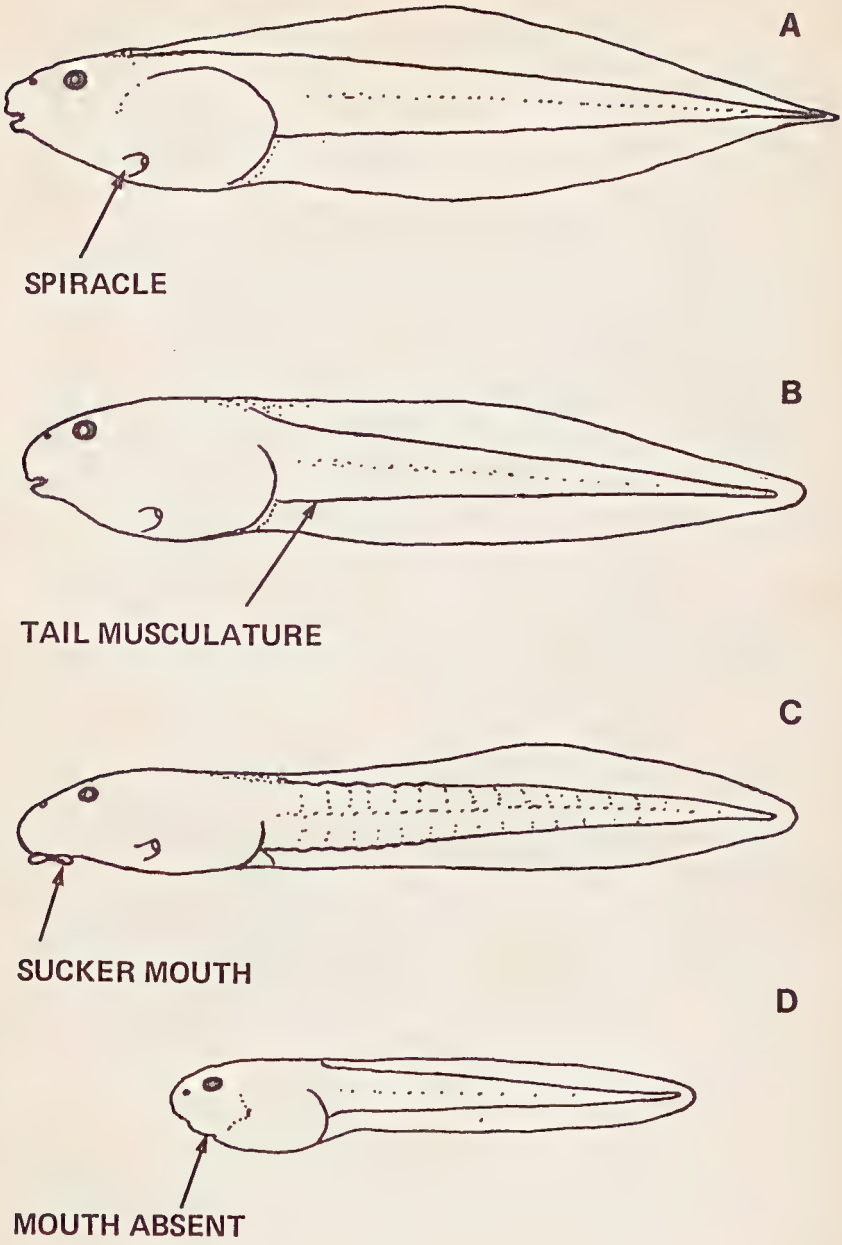

Fig. 1
Basic Tadpole Shapes — see text.
*Adapted from a drawing in Watson and Martin (1973)

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Fig. 2
Tadpole mouth-parts

1. Litoria verreauxi
2. Heleioporus australiacus.
3. Litoria sp.
4. Litoria booroolongensis.

NOTES ON DELMA FRASERI IN THE NORTH-EAST OF VICTORIA

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The area in which I have collected D. fraseri is approximately 10 km south of Beechworth, in the north-east of Victoria. The species is relatively common in the area being found predominantly on grazing land. The highest density of specimens is found in cleared, grazing paddocks with suitable slate stone and wood cover. In summer most specimens are found in retreats under large slate slabs, or under fallen logs and fence posts on the ground. In winter they can be found in decaying logs or between loose fence posts and the ground, usually being at least 30 cm into the soil. Very few specimens are encountered under stone during winter.

No individuals have been found in bushland or amongst large stands of timber in the area, although they can often be found in the leaf litter at the base of single trees in paddocks. D. fraseri show a marked preference for open spaces and sunny areas and can sometimes be discovered in the open on warm days, which may be basking behaviour or simply searching for food.

The species appears to be wholly insectivorous. Wings of the Common Brown Butterfly (Heteronympha merope merope) and remains of grasshoppers were found in an occupied retreat under a slate stone amongst grass. Other insect life in the habitat is the common cockroach, small spiders and beetles, which also form part of the diet. Several specimens have been found in termite infested logs, indicating that termites may also form part of their diet. Captive specimens show a marked preference for termites, also relishing small spiders, grasshoppers and cockroaches.

In captivity the species is extremely vocal and aggressive to others of its kind. Fights are common amongst adults. Juveniles have been seen to attack small skinks in the same cage with the front part of the body raised off the ground and striking repeatedly.

Virtually nothing is known of the breeding behaviour of the species, however two eggs were laid in captivity on the 10th January, being deposited in a depression amongst leaf litter. These measured approximately 23 mm by 10 mm and although incubated they failed to hatch.

BOOK REVIEW

"Practical Nature Study" Goode & Cann. (Sun Books)

For as long as I can recall there have been small books on the captive care of various reptiles — invariably foreign, usually verbally padded and rarely informative. Now, under the rather vague title above, a volume has appeared which goes a long way towards filling the need for a set of basic instructions on the collection and care of reptiles and, additionally, freshwater invertebrates. The remarks here will refer to the reptile section, written by John Cann.

Such a book may at first seem at odds with fauna protection legislation being introduced in each State, however it will be seen that this is not the case and that the law is supported while nurturing the same fundamental interests which have resulted in the development of our professional herpetologists today. To quote the introduction "From a very small start, lifelong interests can develope". Surely society today needs more individuals to have absorbing interests, particularly in natural history.

While it provides adequate information for reasonable success in the maintenance of captive study specimens the impact of the book would have been enhanced by the use of original photographs rather than the line drawings by Julia Cameron which are similar to previously published material. Furthermore the contents could have been expected to better utilise John Cann's wealth of practical experience. Had the reptile section been further developed into a seperate volume with a more specific title its appeal to the established enthusiast would be heightened and young hobbyists are not deterred by additional material. Perhaps we may look forward to such a development in the future.

In final analysis this is undoubtably the most practical and at a price of $2.50 the best value in this field. The author's extensive knowledge is well known and this in itself is sufficient recommendation.

THE PINK-TONGUED SKINK (TILIQUA GERRARDII)

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Belonging to the Blue-tongue family, the Pink-tongue differs in shape by having a more slender build. The tail is prehensile and the claws are sharp, indicating that the Pink-tongue is aboreal. I have come across several Pink-tongues in our school playground, all of which were living under sheets of iron or in holes dug in damp soil.

I have kept several Pink-tongues and have found that while sleeping they hide under the pine bark which is laid on the floor of their cage. I once came across a young Pink-tongue which was hiding in a small mound of loam. After lifting the damp baggage from the top, I discovered several slugs which form the diet of these lizards.

Pink-tongues are found in wet sclerophyll forest and also in rain forest. They emerge from their hiding places, usually beneath the roots of dying or dead trees, at dusk. They enjoy basking in the sun by daytime, but prefer to eat at dusk.

Colour — dorsally dark brown or black, sometimes with black lines running across the body. There is also a tan version with the stripes missing.

When annoyed, the Pink-tongue will exhale quickly through its nose, making a sharp hiss. This method of defence, along with the open mouth method, is quite an effective means of discouraging an attacker.

In captivity, the Pink-tongue makes an interesting specimen and I recommend them to herpetologists who enjoy studying lizards, however I have noticed that they become uneasy and insecure if handled unnecessarily. Mine sleep in a hollow log or under the pine bark and fossick around and even up the masonite walls in search of slugs and snails. This of course would be rather difficult for other members of the genus.

TIGER SNAKE GROUP RESEARCH PROJECT

Compared with our knowledge of mammals and birds, reptiles are unknown quantities. As even the more common species have been neglected an organised team effort on one particular species or genus could, over a period, make most significant contributions to the knowledge of that group.

Tiger snakes, Notechis spp. have been chosen as subjects for a first attempt at such a Society team approach. A Sydney group will initiate a mark and recapture programme using a capture record including details of sex, length, mass, temperature, apparent health, grid reference and weather. A later development intended is the holding of gravid females from the study area to secure and mark the young for immediate release in the study area.

Suitable radio telemetric equipment is being developed to investigate thermal requirements under experimental conditions for later comparison in the field. Other laboratory and captive investigations will involve reproduction hormones, growth rates and food consumption.

A comparison of specimens throughout their range will be made in the hope of linking any differences found in morphology, toxicology or behaviour patterns to geographic features. A cline may, for example, be shown following a river system. It is intended that the distribution of N. scutatus be more precisely described and related to climatic and geographic features.

We appeal to interstate and country herpetologists for information regarding tiger snakes in their area, either complete papers ready for publication, or notes regarding one sighting or one aspect of behaviour. We need specimens for photography, examination and venom sampling. Anyone who can assist please advise D. Millar so that application can be made to the National Parks and Wildlife Service.

The aim of the Society is to stimulate interest in and collate as much information as possible on Notechis spp. and organise data for publication. It is hoped that future developments will see the formation of similar groups investigating other genera.

THE UNSUSPECTED POISON POTENTIAL OF AN INDIGENOUS FROG

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Attention has recently been directed to the toxic potential of species in the frog genus Heleioporus.[1,2] Their biology has been studied in detail by Lee,[3] who determined that of the six species, H. eyerii, H. inornatus, H. albopunctatus, H. pasammophilus and H. barycragus range throughout the south-west of Western Australia and one species, H. australiacus, is found in Eastern Australia, ranging from Gosford, N.S.W. discontinuously through and to the east of the Great dividing Range into Victoria. The toxicity of the Eastern States species has not been established by the laboratory investigations recently conducted in Perth. There is, however, every likelihood that H. australiacus will be found to secrete poison.

For many years, there have been sporadic reports in Western Australia from both veterinarians and the lay public, of domestic cats and dogs suffering and, in some instances, dying shortly after mouthing frogs. These accounts were not considered too seriously and the species of frog was uncertain. As the range of the well-known poisonous toad Bufo marinus does not include Western Australia, this species was not suspect. It was not until two human case histories were revealed, where contact with the frog toxin caused dangerous symptoms, that the genus Heleioporus was incriminated by one of the victims, a University Zoologist.

This suggested the identity of the unknown quantity in previous reports. The reason for obscurity had been twofold:

1. Heleioporus spp. are true burrowing frogs which, although often heard, are seldom seen. Some species in the genus deposit their eggs in a mass of maternal froth in a depression in the soil surface where embryonic development proceeds without immersion in water.

2. Unlike B. marinus, the poison glands, dorsally situated, are not visible externally and the white viscous poison cannot be extruded by external mechanical or any known chemical stimuli.

Histological sections have not revealed any mechanical means whereby a frog can exude poison over the greater part of its back and a neuro-trigger mechanism is suspected. Preliminary poison analysis reveals a structure and action akin to the Bufo toxins and it is suggested that treatment of victims suffering from either or both of the neuro-toxic/corrosive factors may be as for Bufo poisoning.

In Western Australia, Heleioporus spp. males commence calling in April from newly constructed shallow burrows. Attracted by the call, females join the male and during amplexus eggs are laid in the burrow. Calling, mating and egg laying are dictated by the onset of winter rains, which immerse the eggs and precipitate hatching. Air temperatures may range from 5^{o}-23^{o}C during the breeding period and embryonic development may take only 11 days.

Summary:
A poisonous indigenous frog is described with some details of species, range and habitat. Naturalists in the field would be well advised to handle any unknown burrowing frog with caution and treat any dermal exudate on the animal as potentially lethal. For more precise information on the genus Heleioporus, reference can be made to Lee[3].

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Fig. 1
Dorsal aspect of H. eyerii. (photo by E. Laidlaw)

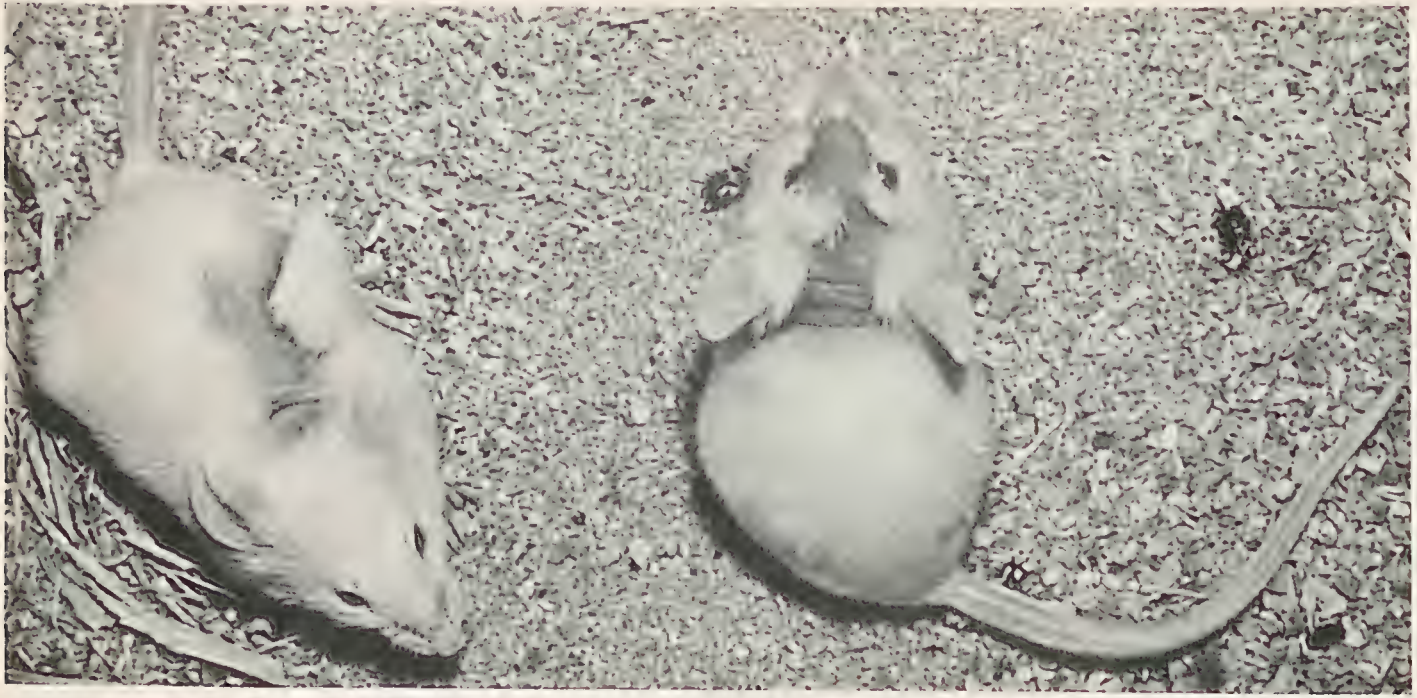

Fig. 2
Partial depilation in laboratory mice at injection site, following sub-lethal introduction of Heleioporus poison (photo by E. Laidlaw).

AN UNUSUAL AGGREGATION OF SNAKES FOLLOWING MAJOR FLOODING IN THE IPSWICH-BRISBANE AREA, SOUTH-EASTERN QUEENSLAND

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In late January 1974, following heavy rain, large areas of Brisbane and Ipswich were inundated by the Brisbane and Bremer Rivers in the worst flood of the century and although the number of specimens brought into the Queensland Museum increased only slightly in the two weeks following the flood, numerous reports were received at the Museum of increased numbers of snakes, and ground-dwelling snakes in trees and houses. These occurrences were obviously the result of displacement of much of the snake population, especially in the western and south western suburbs of Brisbane and in Ipswich, the areas most affected, and are probably to be expected after large scale flooding and consequent disruption of the habitat.

One call received soon after flood waters had subsided reported an unusually high number of snakes rescued from tree tops in two afternoons on either side of the flood peak. Mr. John Kaye, who has previously assisted the Queensland Museum, collected one hundred and ninety-six snakes of ten species in the emergent tree tops within 1 km of his home at Riverview, which is on the opposite side of the Brisbane River to Moggill, an outer Brisbane suburb near the boundary of the Brisbane Metropolitan Area. Most of the area has been cleared for grazing but some of the large trees have been left standing, especially along the banks of the river. All snakes were caught by hand from a boat in a backwater adjoining the main river. The species caught with numbers of specimens in brackets, and approximate minimum and maximum sizes, where these are available, are:

Demansia psammophis (76) 25-125 cm; Dendrelaphis punctulatus (68) 30-200 cm; Morelia spilotes variegata (26) 270 cm; Amphiesma mairii (10+); Pseudonaja textilis (9) 180 cm; Ramphotyphlops sp. (3) Q.M. J23965, J23966, one released; Pseudechis porphyriacus (1); Boiga irregularis (1)?; Liasis childreni (1); Brachyurophis australis (1).

The indentification of only one snake is uncertain. This was a specimen believed to be Liasis childreni from Mr. Kaye's description. L. childreni is well known in the western suburbs of Brisbane (Covacevick, 1970, p.12) and undoubtedly occurs in the Riverview area. All other species represented are common, known to Mr. Kaye and with the exception of Brachyurophis australis, were known previously from Riverview and the adjoining western suburbs of Brisbane.

Although the occurrence of large numbers of Notechis scutatus, Pseudechis porphyriacus, and Pseudonaja textilis has been observed during flooding along the Murray River in Victoria (C. Tanner, pers. comm.) this accumulation of many specimens of several species has not been reported before in the literature dealing with Australian

snakes. It is obvious that unnatural conditions account for the occurrence of burrowing species (Ramphotyphlops sp., Brachyurophis australis), ground dwelling species (Amphiesma mairii, Demansia psammophis, Pseudonaja textilis, Pseudechis porphyriacus) and tree climbing species (Dendrelaphis punctulatus, Morelia spilotes variegata, Boiga irregularis) in close association in tree tops. Many of the species collected have been observed swimming creeks and Bellairs (1969 p.87) has noted that although it is "wrong to take swimming ability for granted in reptiles", it is easy to imagine "that most if not all reptiles can swim if they have to". The number and variety of snakes found in this sample certainly suggests that these species can swim if the necessity to do so arises.

All of the trees in similar adjoining areas, up and down stream, provided refuge for similar numbers of snakes (J. Kaye, pers. comm.). It seems reasonable to assume that the snakes collected at Riverview occurred naturally in that area and that they simply swam up with the rising floodwaters to the safety of the tree tops of the area. There is no evidence to suggest that the accumulation observed was the result of specimens being swept down the river to the tree tops at Riverview.

The belief that all of these snakes occurred naturally in the small area observed raises several interesting questions, most of which must remain unanswered until further data are available. The situation described here, however, presents a unique chance to comment on these questions.

1. Does flooding and consequent discovery of 76 Demansia psammophis in one small area present evidence of summer breeding aggregations of this species? Close to 40% of the snakes discovered here were Demansia psammophis. This species is known to be a community egg-layer (Covacevich & Limpus, 1972, pp.208-210) and is suspected of occurring in aggregations prior to and immediately following egg-laying. D. psammophis is, however, common in Brisbane (Covacevich 1970, p.24) and although it is tempting to assume that this number in one area represents a summer breeding aggregation, no such conclusion can be reached. It is likely that D. psammophis, a species which feeds primarily on small skinks, is simply extremely common in Riverview and adjoining areas of Ipswich and Brisbane.

2. Is this further evidence of communal dwelling here during summer, by Dendrelaphis punctulatus, and Morelia spilotes variegata? Winter aggregations of these species and Boiga irregularis have been observed recently near Cooroy and Gympie in south-eastern Queensland (Covacevich & Limpus 1973, p.16-21). Again the high incidence of Dendrelaphis punctulatus & Morelia spilotes variegata can, at best, be regarded as only circumstantial evidence of summer communal dwelling.

3. Do the numbers found shed any light on the problem of how many snakes a particular area can support? The species found are, with one exception (Brachyurophis australis), those to be expected in this area and are considered typical of Brisbane's western suburbs (Covacevich, 1970, pp.2-37). Mr. Kaye collected almost all the snakes in his area and it must be assumed that they are representative of both numbers and species found naturally in the area. The species found are a mixture of burrowing, terrestrial and arboreal snakes, both diurnal and nocturnal, which variously feed on skinks, frogs, mammals, termites and ants (?Ramphotyphlops). Two snakes which are common

in Brisbane's western suburbs (Furina diadema and Acanthophis antarcticus) were not collected and the collection of specimens of these species along with more Pseudechis porphyriacus would not have been surprising.

4. Is there any truth in the frequent reports that, with the occurrence of Cane Toads, Bufo marinus in an area, populations of ground-dwelling, frog-eating snakes (excluding Amphiesma mairii) decline drastically? Bufo marinus is very common in the Riverview area. It is impossible to make any definite comment on this subject from the data available but it is interesting to note that one of the species widely reported to be badly affected by the occurrence of Bufo marinus — Pseudechis porphyriacus — is scarce in the sample collected and that Amphiesma mairii, a species known to feed on Bufo marinus (Lyon, 1973, p.4) is relatively common. The three species found most frequently would be unlikely to be directly affected by the occurrence of Bufo marinus in the area because of their dietary preferences (Demansia psammophis — skinks; Dendrelaphis punctulatus — tree frogs, skinks; Morelia spilotes variegata — mammals, birds).

Brachyurophis australis occurs in coastal Queensland and New South Wales (Kinghorn, 1956, p.149 and Worrell, 1970, p.112) and in central and western Queensland (Queensland Museum reference collection) but has not been reported before from the Ipswich or Brisbane area (Covacevich, 1970, pp.2-32). The collection and release of one specimen in Mr. Kaye's sample brings to three the number of specimens known from the area — Queensland Museum speciment J5066, Grovely, Brisbane, September, 1930; Queensland Museum slides MF253-5, Riverview, March, 1970; specimen released Riverview, January 1974. These data indicate that this species is an uncommonly seen but definite inhabitant of Brisbane and Ipswich suburbs.

The full effects of the 1974 flood on the reptile fauna of Ipswich and Brisbane will never be known but specimens displaced by the floodwaters may be found in unusual circumstances for some time. Many lizards were found in the tree tops with the snakes, though no records of species or numbers were kept. Mammals seem to have been more directly affected by the flood than reptiles and while carcasses of Brush-tailed Possums (Trichosurus vulpecula), Ringtailed Possums (Pseudocheirus peregrinus) and Platypus (Ornithorhynchus anatinus) were found in the area, no dead reptiles were recovered. Indirect effects resulting from a scarcity of small skinks, frogs and mammals killed in the floodwaters cannot be assessed and may persist.

Acknowledgements:
John Kaye drew my attention to the snakes described here and provided all the information on the specimens collected. Peter Bostock provided the slides of B. australis from Riverview. Glen Ingram has given helpful advice.

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A NEW SOUTH-EAST LOCALITY FOR THE SKINK ANOMALOPUS RETICULATUS

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On May 4th 1974 while collecting reptiles and frogs in a relict stand of rainforest six kilometers south-east of Maleny in south-east Queensland, a specimen of the skink Anomalopus reticulatus was found underneath a rotting log lying on the forest floor.

This specimen has been lodged in the Queensland Museum as QM J24348. The snout-vent length of the specimen is 130 mm. Tail length is 142 mm. Mid-body scale rows are twenty six in number. In life the colouration on QM J24348 was as follows: dorsal surface of head and body fawn brown; dorsal surface of tail grey; sides of face and neck pale yellow; throat yellow with scales outlined in grey; remainder of ventral surface cream with scales strongly outlined in grey; eyes black with scales around eye black.

Maleny is located about 90 kilometers north of Brisbane on the Blackall Range. This area once supported large tracts of sub-tropical rainforest. These forests have since been reduced, as the result of intensive dairy farming, to small stands of isolated pockets in relatively inaccessible areas. The specimen of A. reticulatus was secured from a stand approximately three hectares in area. The terrain was relatively flat with very few surface stones present and the forest floor was covered by a light leaf litter. The stand had not been significantly invaded by non-rainforest plants, however the high percentage of young Ficus and Dendrocnide trees present, as well as low canopy indicated that the stand had been heavily logged in the past and that extensive regrowth was occurring.

Other members of the genus Anomalopus which also occur on the Blackall Range are A. truncatus and A. verreauxi. The former appears restricted to rainforest while the latter has a more widespread distribution. A reticulatus is identified from A. truncatus by its greater size, and its colouration and slender form identifies it from A. verreauxi.

Worrell (1963) gave the distribution of Lygosoma reticulatum as northern New South Wales, while Arnold (1966), in a taxonomic review of Queensland lygosomid skinks, gives south-east Queensland as the distribution of Saiphos reticulatum in this state. An investigation of specimens of Anomalopus reticulatus in the Queensland Museum reveals that QM J24348 is the only specimen taken from an area north of the MacPherson Range area of Queensland. At present the Blackall Range appears to be the most northern point of distribution. However, I feel that the species could also occur in other suitable rainforest areas in this region. If A. reticulatus should follow a similar distributional pattern to Sphenomorphus murrayi, its congeners, and the rainforest frequenting leptodactylid frogs Rheobatrachus silus and Taudactylus diurnis, this skink would probably occur on the adjacent Conondale Range.

I wish to thank Mr. Glen Ingram of the Queensland Museum for his very useful advice and aid in the completion of this article, as well as Miss Jeanette Covacevich, Curator of Reptiles and Amphibians, for her criticism of the manuscript.

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